P R O T O C O L

Meeting of the U.S. delegation on "Cold Weather Construction Techniques" with Representatives of the Ministry of Power and Electrification of the U.S.S.R.

Moscow - October 8, I974

In accordance with the U.S. -USSR agreement on cooperation in the field of science and technology signed in Moscow 24 May, I972 and with the record of the first meeting of the Joint U.S. - USSR Work Group on Scientific and Technical Cooperation in Water Resources signed in September 30, I972 the meeting of the US delegation made up of representatives from the Corps of Engineers, and the Bureau of Reclamation, U.S. and the Ministry of Power and Electrification, USSR, was held in Moscow at interval from September 24 to October, 8, I974, to discuss the problems concerning scientific and technical cooperation on "Cold Weather Construction Techniques".

The U.S. delegation was headed by Mr. Frederick R. Brown, U.S. Project Coordinator and Technical Director of the U.S. Army Corps of Engineers, Waterways Experiment Station.

The USSR delegation was headed by Dr. L.I. Kudoyarov, Soviet Project Coordinator, Chief Engineer of the Planning and Research Departament of the Ministry of Power and Electrification.

Delegates participating in the meeting are listed in Appendix I.

The following items were discussed and agreed upon at the meetings:

I. The Program and Itinerary of the U.S. delegates in the USSR (Appendix 2).

2. Suggestions on the organization and details of scientific and technical cooperation on "Cold Weather Construction Techniques" (Appendix 3).

3. Current plans for scientific and technical cooperation for I974-75 (Appendix 4).

Above referenced appendices are attached as part of this Protocol.

As a result of long and varied discussion both sides concluded that it would be desirable:

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to provide opportunities for exchanging information on research, design, construction and maintenance of engineering structures in cold regions;

- to provide engineering services in the field of research and design. The conditions for accomplishing these services would be the subject of separate agreements;

- scientific and technical information exchanged may be freely used by the receiving country and exchanged with other countries unless the furnishing country specifies restrictions on interchange with third countries. When so requested, the receiving country will make such arrangements as needed to assure that request of the furnishing country is followed.

Commercial, financial or legal problems which could arise from cooperative efforts should be the subject of special discussions and agreements.

It was concluded that exchanges of delegations or representaties free of currency exchange problems would contribute to the success of the envisioned cooperative effort. A plan in which the side receiving a delegation or representatives would bear all the costs of their stay in the receiving country would avoid such problems.

The arrangements set forth in this Protocol are subject to such in-country approvals as required to assure the participation of the agencies having technical capabilities in the areas involved.

Details of the program will be further defined during the return visit of the delegation or upon agreement of the coordinators from both sides or their designated representatives. The arrangement set forth in the Protocol can be cancelled if one of the sides informs the other side in a written form 6 months in advance of their wish to stop cooperative effort. The cancellation of the arrangements will not affect the validity of agreements or contracts which are underway. The arrangement can be continued beyond the five year period based upon rules established by the Joint U.S.-U.S.S.R. Working Group.

Both sides discussed their problems in a spirit of mutual understanding and respect.

The present Protocol is signed in English and in Russian on the 8th of October, 1974 in Moscow in two copies. Both texts are authentic and equally authoritative.

For the U.S. Delegation on "Cold Weather Construction Techniques"

Frederick R. Brown

Frederick R. Brown
U.S. Project Coordinator

For the U.S.S.R. Ministry of Power and Electrification

Dmitri M. Yurinov,
Chief, All-Union
Design, Survey and
Research Institute
"Hydroproject"

Appendix I

L I S T

of participants in the meeting in the USSR on scientific and technical cooperation in "Cold Weather Construction Techniques"

25 September - 9 October, 1974

I. The U.S. delegation included:

1. Fred R.Brown - U.S. Project Coordinator, Head of the U.S.delegation, Technical Director, Waterways Experiment Station, U.S.Army Corps of Engineers, Vicksburg, Miss.

2. Dean R.Freitag - Ph.D.,P.E., Technical Director, Cold Regions Research and Engineering Laboratory (CRREL), U.S.Army Corps of Engineers, Hanover, N.H.

3. Homer B.Willis - Chief, Engineering Division, Civil Works Directorate Office, Chief of Engineers, U.S.Army Corps of Engineers, Washington, D.C.

4. Phillip L.Cole - Chief, Engineering Division, North Pacific Division, U.S. Army Corps of Engineers, Portland, OR.

5. William R.Groseclose - P.E., Chief, Division of Construction, Bureau of Reclamation, U.S.Department of the Interior, Denver Federal Centre, Denver, Colorado.

6. Andrew Assur - D.Sc., Chief Scientist, Cold Region Research and Engineering Laboratory (CRREL), U.S. Army Corps of Engineers, Hanover, N.H.

II. The USSR delegation included:

I. L.I.Kudojarov - USSR Project Coordinator, Head of the USSR delegation, M.Techn.Sc., Chief of the Planning and Research Department (GLAVNIIPROJEKT), USSR Ministry of Power and Electrification.

2. D.M.Jurinov - Chief, "Hydroproject" Institute, USSR Ministry of Power and Electrification.

3. I.L.Sapir - Chief Engineer, "Hydroproject" Institute, USSR Ministry of Power and Electrification.

4. A.G.Oskolkov - Chief, Scientific and Research Centre, "Hydroproject" Institute.

5. J.K.Sukhanov - Prof., Deputy Chief Engineer, "Hydroproject" Institute.

6. I.S.Moiseev - M.Techn.Sc., Deputy Chief Engineer, "Hydroproject" Institute.

7. A.G.Lykosnin - M.G.-M.Sc., Deputy Chief Engineer, "Hydroproject" Institute.

8. L.N.Toropov - Chief, Technical Department, "Glavvostok - gidroenergostroi", USSR Ministry of Power and Electrification.

9. V.Y.Sherskov - Expert, "Hydroproject" Institute.

10. V.G.Samarin - M.Techn.Sc., Senior Scientist, Scientific and Research Centre, "Hydroproject" Institute.

11. R.V.Krasovitski - M.Techn.Sc., Deputy Director of All-Union Research Institute of Hydraulics (VNIIG).

I2. A.N.Znebrovski - Chief, Technical Department, VNIIG.

I3. V.V.Goncharov - M.Techn.Sc., Scientific Secretary, VNIIG.

I4. L.K.Domanski - Chief Engineer, Leningrad Section, "Hydroproject" Institute.

I5. A.F.Vasiljev - Deputy Chief Engineer, Leningrad Section, "Hydroproject" Institute.

Appendix 2

PROGRAM AND ITINERARY
of the US delegation on "Cold Weather
Construction Techniques" in the USSR

September 24 - Arrival in the USSR (the Sheremetievo Airport, Moscow).

September 25 - Visit to the USSR Ministry of Power and Electrification; meeting with L.I.Koudoyarov, the USSR Project Coordinator. Visit to the "Hydroprojeot" Institute. Discussion of the program and itinerary. General information about the "Hydroprojeot" Institute activity.
Information about the activity of the U.S. Army Corps of Engineers and Bureau of Reclamation.
Discussion of problems of hydraulic engineering in cold weather conditions and problems of cooperation in the fields of research, investigations, surveys, design, construction and maintenance of Hydrostructures. Discussion of possible forms of scientific and technical cooperation.
Evening program.

September 26 - Visit to the "Hydroprojeot" Institute Scientific Research Centre. General information about main directions and aims of the Centre activity. Inspection of leading laboratories. Discussion of the possible themes of scientific and technical cooperation. Departure for Leningrad.

September 27 - Arrival at Leningrad. Visit to the All-Union Institute of Hydraulic Engineering (under the Ministry of Power and Electrification of the USSR). General information about the tasks of the Institute. Discussion of the possible themes of the scientific and technical cooperation.

		Inspection of leading laboratories. Evening program.
September 28	–	Sightseeing tour in Leningrad. Departure for Moscow.
September 29	–	Arrival at Moscow. Visit to the Moscow Kremlin. Departure for Irkutsk.
September 30	–	Arrival at Irkutsk. Flight to Mirnyi. Departure for Chernyshevskii.
October 1	–	Visit to the Vilui hydroelectric stations. Discussion of problems related to cold weather construction.
October 2	–	Left Mirnyi for Irkutsk. Then to Bratsk.
October 3	–	Flight to Ust-Ilimsk and visit to the Ust-Ilim Hydroelectric Project Site. Return to Bratsk.
October 4	–	Visit to the Bratsk Hydroelectric Station.
October 5	–	Flight to Irkutsk. Bus journey to the Baikal Lake. Return to Irkutsk.
October 6	–	Visit to the Irkutsk Hydroelectric Station. Flight to Moscow (the Domodedovo Airport).
October 7	–	Visit to the "Hydroproject" Institute. Discussion of results of inspection of the Soviet hydropower projects and of plans of scientifical and technical cooperation. Discussion on the Draft Protocol on cooperation for the "Cold Weather Construction Techniques" Project. Evening program.

October 8 – Visit to the "Hydroproject" Institute. Concluding meeting; signing the joint documents.

October 9 – Departure from the USSR (the Sheremetievo Airport, Moscow).

O R G A N I Z A T I O N

of the USSR - U.S. scientific and technical cooperation on "Cold Weather Construction Techniques"

The bilateral scientific and technical cooperation on "Cold Weather Construction Techniques", includes a wide scope of problems in research, investigations, surveys, designing, construction and maintenance of hydraulic power and other hydraulic structures in cold regions, and provides for exchange of experiences in this field.

Cooperative efforts shall be closely outlined and the work conducted on a mutually advantageous basis.

I. Organization of Cooperation

Guidance of cooperation will be as given by the corresponding Joint U.S. - USSR Working Group for scientific and technical cooperation. Coordination will be implemented by a group of experts on the topic "Cold Weather Construction Techniques" to which each side appoints its specialists. The short-term (1 to 2 years) cooperation will be carried out according to current plans, where topics, responsible agencies, terms, forms of cooperation and needed measures are shown.

II. Forms of Cooperation

The forms of scientific and technical cooperation are as follows:

I. Mutual exchange of scientific and technical information on problems of interest to both sides, including publications, reference books, manuals, standards in force etc., as well as results of investigation and development work carried out in accordance with joint current plans.

2. Sponsorship of Joint Seminars and Symposiums on problems of mutual interest.

3. Exchange of delegations of specialists for consultations and for exchange of experience of "Cold Weather Construction Techniques", in particular for research and investigations, design and exploitation of hydrotechnical, hydroenergetic and other structures connected with the development and use ofwater resources.

III. Themes of Cooperation

The main trends in the scientific and technical cooperation are aimed at the following topics of mutual interest:

1. Principles followed in establishing the infra-structure in sparsely populated cold regions and the associated problems of organization, planning and management of construction work.

2. Methods used in concrete construction and in open and underground earth-and-rock excavation under conditions of low temperatures. Choice of construction and transporting equipment, requirements for building materials (concrete, soil materials, stone, polymeric materials, ice etc.) used in structures in cold regions.

3. Scope and techniques used in the investigations of physical and geotechnical properties of soils and rocks in the foundations of structures, including permafrost soils; methods of aseismological evaluation of areas of construction.

4. Modern methods of analysis for theoretical and experimental investigation of the stressed (and thermal stressed) state of dams. Crack formation and stability of concrete dams and embankment dams in cold regions.

5. Types and rational designs of structures (dams, power houses, ship locks etc.) and methods of construction in cold regions, including pumped storage plants, water outlets and water cont-

rol structures. This includes cold region requirements for mechanical, hydropower and electrical equipment.

6. Experience on maintenance of large hydroelectric projects in cold regions, including measures taken for safety and reliability of structures.

7. Control observation of structural behaviour including instrumenting of structures and their foundations, analysis and generalization of full scale field observations.

8. Hydraulic, filtration and ice-engineering investigations of structures, foundations, adjoining water bodies and freezing waterways.

9. Problems of protection and conservation of environment in areas of construction and water resources development in cold regions.

IV. List of Cooperative Agencies

From the U.S.side:

1. Corps of Engineers, U.S.Army, including
   a) Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire
   b) Waterways Experiment Station, Wicksburg, Mississippi
   c) North Pacific Division , Portland, Oregon
2. Bureau of Reclamation, Department of Interior, Denver, Colorado.
3. Other organizations, as required.

From the USSR side:

1. USSR Ministry of Power and Electrification
2. All-Union Design, Servey and Scientific Research Institute "Hydroproject", Moscow (USSR Ministry of Power and Electrification)
3. The Scientific Research Centre of "Hydroproject" Institute, Moscow
4. The All-Union Institute of Hydraulic Engineering, Leningrad
5. Other agencies (as required).

Note:

The American side suggested the addition of , in particular the Permafrost Institute of the Academy of Sciences of the USSR (Siberia Department), R & E Institute of Foundations and Underground Construction of the Gosstroi USSR and the Moscow Civil Engineering Institute of the Ministry of Higher Education.

Appendix A

Current Plan

for scientific and technical US-USSR cooperation in 1974-75

on "Cold Weather Construction Techniques"

Nos	Planned work	Responsible agencies in USSR	Responsible agencies in US	Dates and meeting places	Forms of cooperation and organizational questions
1	2	3	4	5	6
I	First meeting of representatives of the USSR Ministry of Power and Electrification and of US Army Corps of Engineers and Bureau of Reclamation on:	USSR Ministry of Power and Electrification, All-Union Institute "Hydroproject", Scientific Research Centre of "Hydroproject" Institute (Moscow); All-Union Institute of Hydraulic Engineering (Leningrad)	US Army Corps of Engineers: Cold Regions Research and Engineering Laboratory, Waterways Experiment Station and North Pacific Division; Bureau of Reclamation	USSR, Moscow September 24-October 9, 1974	1) Preparation of the Joint Protocol on scientific and technical cooperation;
	a) Examination of joint suggestions for scientific and technical cooperation;				2) Preparation of suggestions on organization, forms and themes of cooperation;
	b) Adoption of the joint plan of scientific and technical cooperation for 1974-75;				3) Preparation and adoption of the current plan of cooperation for 1974-75;
	c) Information about the USSR experience in research and construction of hydraulic structures in cold regions				4) Visit of US delegation to scientific research centers of the USSR Ministry of Power and Electrification in Moscow and Leningrad and to hydropower projects under construction in Siberia (special program).
2.	Exchange of lists information documents on this theme	Ditto	Ditto	Till the end of 1974	Exchange of lists

RECORD

OF

US-USSR JOINT PROJECT GROUP MEETING ON PROJECT II-3

"PLASTICS IN HYDROTECHNICAL CONSTRUCTION"

Moscow, USSR September 28, 1974

I

1. In accordance with the US-USSR Agreement on Cooperation in the Fields of Science and Technology signed May 24, 1972, and the decisions of the US-USSR Joint Commission on Scientific and Technical Cooperation, and the results of discussions of the first meeting of the US-USSR Joint Working Group on Scientific and Technical Cooperation in the Field of Water Resources signed September 30, 1972, the second meeting of the US-USSR Joint Project Group on Plastics in Hydrotechnical Construction was held in Riga and Moscow, USSR, September 25-28, 1974.

2. Project coordinators who headed US and USSR groups:

For the US :

H.G. Arthur, Director of Design and Construction, Bureau of Reclamation

For the USSR :

P.B. Sviklis, Director of VNIIvodpolymer

The list of participants is attached (Supplement No 1).

3. The following items were discussed :

1) Progress on joint cooperation to date.

2) Joint Program of Work for USSR-US Scientific and Technical Cooperation on II-3 "Plastics in Hydrotechnical Construction" for 1974-1980.

3) Exchange of groups of scientific specialists between USSR and US.

II

1. The coordinators noted that satisfactory progress has been made in accomplishing the program as outlined in the Record of Agreement signed on July 24, 1974 in Denver, Colorado USA.

These accomplishments have been made through visits by joint working group members to the US and USSR and an exchange of opinion and information on the activities carried on in each country in the field of plastics application in hydrotechnical construction.

2. The joint work program included in the July 24, 1974 agreement, was updated and expanded for the 1974 through 1980 program. These amendments were made in accordance with the interests of both the American and Soviet Sides. It was further agreed that the program may be revised through joint agreement as the need arises during program implementation.

Since the completion of all base topics of the cooperative program demands considerable time, the program extends through 1980. This program is conditioned on the extension of the basic Agreement on Scientific and Technical Cooperation between the US and USSR signed May 24, 1972.

3. Both groups find it advisable to periodically exchange materials and documentation of work activities in order to provide timely information necessary to efficiently implement the program. The exchange of materials will be made by the coordinators; the US coordinator points out that direct communications are considered necessary to complete the program on schedule.

4. The necessity of exchange of groups of scientific specialists between the US and the USSR in accordance with the cooperation theme (II-3) in 1975 was also discussed at this joint meeting. It was agreed that a visit of US specialists to the USSR to confer and to make detailed plans for carrying out programmed activities for categories of work II-3-1 and II-3-2 will be made during the second quarter of 1975. During the same year a visit of USSR specialists will be made to the US for similar activities for categories of work II-3-1 and II-3-3.

It is contemplated that additional exchanges will be found necessary during the 1976 to 1980 period, as the work progresses.

5. During the visit in the USSR the U.S. group became acquainted with the work of Research and Design Institutes and technical solutions and practices used at hydrotechnical construction sites. The following were visited :

- Ministry of Reclamation and Water Management of the USSR ;
- Ukrainian Research Institute of Reclamation and Water Resources (Ukrainian NIIGiM) ;
- Ukrainian State Institute for Designing Hydrotechnical Construction ;
- Northern Research Institute of Hydrotechnics and Reclamation ;
- Ministry of Reclamation and Water Management of Latvian SSR ;
- International Exposition "Polymeri - 74" in Moscow ;
- All-Union Exposition "V.D.N.Kh." (the pavilion Reclamation and Water Management);
- Construction Sites of the Kakhovka canal ;
- Head Structure of the Northern Crimea canal.

The US group likewise became acquainted with the basic directions of research work of the newly established ALL-union Research Institute for Use of Polymers in Reclamation and Water Management (VNIIvodpolymer).

6. It is understood by the coordinators that financing of all activities associated with the joint works as provided by the program be realized in accordance with the decisions adopted by the US-USSR Joint Commission on Scientific and Technical Cooperation.

It is further understood that the implementation of the program is subject to the availability of funds.

7. There was desire, expressed by both sides, for early practical, beneficial results in execution of works provided by the program.

8. The project coordinators and the participants of this joint meeting state with satisfaction that the talks were fruitful and

held in an atmosphere of friendship and mutual understanding and assured further development of personal contacts, that will contribute to the development and implementation of cooperation in the field of plastics application in hydrotechnical construction.

The present document was signed on September 28, 1974 in two copies, English and Russian, both copies being equally valid.

P.B. Sviklis
USSR Project Coordinator

H.G. Arthur
US Project Coordinator

LIST OF PARTICIPANTS AT THE MEETING ON PROJECT II-3 " PLASTICS IN HYDROTECHNICAL CONSTRUCTION "

US Group :

H.G. Arthur	-	Coordinator of the Project, Director of Design and Construction, Bureau of Reclamation
W.J. Ochs	-	Water Management Engineer for Drainage, Soil Conservation Service
R.E. Philleo	-	Chief, Concrete Branch ; Office, Chief of Engineers
J.P. McGarvey	-	Technical Director - Film Operations, Arco Polymers, Inc.
G.N. Thorsky	-	Chief, Division of Engineering Support, Bureau of Reclamation

USSR Group :

P.B. Sviklis	-	Coordinator of the Project, Director of the All-union Research Institute for Use of Polymers in Reclamation and Water Management
A.I. Kharin	-	Deputy Director, Ukrainian Research Institute of Hydraulics and Reclamation of the USSR Ministry for Reclamation and Water Management
J.J. Valter	-	Department Chief, Coordination of Research Work, VNIIvodpolymer
I.E. Krichevsky	-	Department Chief, New Building Materials, Northern NIIGiM

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JOINT PROGRAM OF WORK
FOR SCIENTIFIC AND TECHNICAL COOPERATION
OF THE USSR-US WORKING GROUP ON PROJECT II-3
"PLASTICS IN HYDROTECHNICAL CONSTRUCTION" FOR 1974-1980

No.	Category of work	Activities in carrying out work by stages	Sponsors USSR	Sponsors USA*	Duration of work	Expected results
1.	II-3-1 Design and technology of constructing plastic film linings in canals and reservoirs. (a) Investigations of effective use of plastic membranes in construction of water management systems under different environments.	1. Exchanging scientific technical information.	NVIIVodpolymer.	Bureau of Reclamation, E&R Center, U.S. Department of the Interior	III, 1974	Improvements in methods and apparatus for investigating physical and mechanical properties of plastic membranes used in constructing seepage-controlling linings. Technical requirements of film materials for use under differing environments.
		2. Exchanging investigation methods for physical and mechanical properties and aging processes of membranes.	Northern NIIG-M. Ukrainian NIIG-M.		III, 1974 through II, 1975	
		3. Exchanging small quantities of various plastic materials for physical and mechanical tests.	NPO "Plastic."		II, 1975	
		4. Exchanging data on research equipment and technical documents on test methods.			III, 1974 through IV, 1975	

* Footnote: The Bureau of Reclamation will be responsible for the overall coordination of all categories of work among the U.S. Department of Agriculture, the Corps of Engineers, and the Society of Plastics Industry. The lead agency for each category is shown in column 5.

No.	Category of work	Activities in carrying out work by stages	Sponsors USSR	Sponsors USA*	Duration of work	Expected results
		5. Conducting complex laboratory investigations and working out technical requirements of plastic materials in use under differing environments.			IV, 1975 through II, 1976	
		6. Investigation and exchange of information on improved ultra-violet stabilizing systems toward enhancing the aging characteristics of those membranes which presently are the least resistant to exposure degradation.			II, 1976 through IV, 1979	
		7. Conducting technical investigations of performance of plastic materials under various climatic and soil conditions.			II, 1976 through IV, 1979	
		8. Exchanging information on results of physical and mechanical investigations. Discussion of results.			IV, 1976 through IV, 1979	
	b. Improving technology of installing watertight plastic linings of canals and reservoirs.	1. Exchanging scientific technical information on placement technology for plastic watertight linings.	VNIIVodpolymer. Ukrainian NIIG-M.	Bureau of Reclamation, E&R Center, U.S. Department of the Interior	III, 1974	Recommendations on the design and construction of plastic membrane lined systems which will improve their performance and reduce costs.
		2. Planning of construction of joint cooperative experimental projects in both nations with use of Soviet and American films.	Northern NIIG-M.		II, 1975 through IV, 1977	

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No.	Category of work	Activities in carrying out work by stages	Sponsors USSR	Sponsors USA*	Duration of work	Expectected results
		3. Investigating and determining seepage rates of plastic lined canals and reservoirs and of other competetive types of lined systems.			II, 1975 through II, 1977	
		4. Investigating to provide better, more economical cover for plastic linings; improved field seaming methods.			II, 1975 through II, 1977	
		5. Laboratory and field testing of high density polyethylene membrane systems.			II, 1977	
		6. Studying construction technology of plastic membrane cutoffs; exchange of technical documents and work experience. Developing interim recommendations for seepage control linings.			III, 1974 through III, 1976	
		7. Evaluating any newly developed plastic membranes that may have potential as waterproof liners.			II, 1975 through III, 1979	
		8. Discussing results of various joint experiments in improvements of systems of plastic membrane linings and cutoffs (according to categories of work).			II, 1975 III, 1976 through IV, 1979	
		Completing categories No. 1 (a) and (b) preparing report, recommendations and discussing results.			III, 1980	

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No.	Category of work	Activities in carrying out work by stages	Sponsors USSR	Sponsors USA*	Duration of work	Expected results
2.	II-3-2 Utilization of polymers in soil stabilization on cut and embankment slopes. (a) Investigation of effectiveness of chemical materials in soil stabilization.	1. Exchanging scientific technical information on application of stabilizing materials for earth stabilization.	VNIIV odpolymer. Ukrainian NIIG-M.	Bureau of Reclamation, E&R Center, U.S. Department of the Interior	III, 1974	Recommendation on selection and use of chemical materials for soil stabilization. Improved useage.
		2. Exchanging opinions on basic trends of work to be jointly done.			III, 1975	
		3. Conducting cooperative field tests to investigate such usages as dust abatement, erosion control, and moisture control. Researching chemical materials for stabilizing soils.			IV, 1975 through IV, 1979	
		4. Exchanging performance data on new materials as they become available.			II, 1975 through II, 1979	
		5. Discussing results of various cooperative investigations of usage of chemical materials for stabilizing soils.			III, 1976 through III, 1979	
		6. Completing category No. 2 and preparing report.			II, 1980	
3.	II-3-3 Investigation of effectiveness of plastic pipes in drainage and irrigation structures.	1. Exchanging scientific technical information, standards, and instructions on use of plastic pipes in drainage and irrigation, including materials and design of envelopes for drainage pipe.	VNIIVodpolymer. Northern NIIG-M. NPO "Plastic."	Soil conservation Service Department of Agriculture	III, 1974 through IV, 1975	Recommendations on usage of plastic pipes in drainage and irrigation systems. Improved specifications, quality control, joints, drainage envelopes, and construction.

No.	Category of work	Activities in carrying out work by stages	Sponsors USSR	Sponsors USA*	Duration of work	Expected results
		2. Obtaining plastic irrigation and drainage pipe of differing technical parameters including joints.			I, 1975 through II, 1976	
		3. Exchanging information and technical documents on application of nondestructive methods for quality control of plastic pipes.			II, 1975	
		4. Encouraging development of corrugated PVC tubing and styrene rubber drainage tubing through joint research, testing, evaluation and exchange of information on testing and specifications requirements.			IV, 1975 through IV, 1977	
		5. Conducting detailed investigations of physical and mechanical properties on differing types of plastic drainage tubing and pipe considering their use under various environments.			III, 1976 through II, 1978	
		6. Planning of construction of joint cooperative experimental projects in both nations with use of Soviet and American plastic pipe.			II, 1975 through III, 1977	
		7. Investigating and developing new, more economical envelope materials for drainage systems. Exchanging ideas on ideal properties of envelope materials and what new, economically promising materials should be tried.			II, 1975 through II, 1976	

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No.	Category of work	Activities in carrying out work by stages	Sponsors USSR	Sponsors USA*	Duration of work	Expected results
		8. Investigating, evaluating, and developing jointing systems for plastic irrigation pipe.			II, 1975 through II, 1977	
		9. Researching bacteria formation and its effects on plastic tubing drainage systems including existing sludge problems, their causes, prevention, and treatment.			I, 1976 through IV, 1978	
		10. Exchanging experience on designing and construction of drip and subsoil irrigation systems using plastic materials.			III, 1975 through IV, 1978	
		11. Discussion of results of various cooperative investigations of plastic pipe for irrigation and plastic tubing systems for drainage.			III, 1976 through III, 1979	
		12. Completing category No. 3 and preparing report.			II, 1980	
	II-3-4					
4.	Utilization of polymer-concrete in wear and cavitation resisting linings in hydraulic structures and also in repairs of concrete units.	1. Exchanging scientific technical information and documents on polymer-concrete use and identifying respective properties.	VNIIVodpolymer. Ukrainian NIIG-M.	U.S. Army Corps of Engineers	III, 1974 through II, 1975	Recommendations on selecting monomers and synthetic resins and catalytic agents and promoters of polymerization for impregnation of concretes.
	(a) Investigation of polymer impregnated concrete (polymer impregnated portland cement concrete).	2. Study of investigation methods and application experience with polymer-concretes in U.S. and USSR construction, and onsite studies.			II, 1975 through III, 1979	

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No.	Category of work	Activities in carrying out work by stages	Sponsors USSR	Sponsors USA*	Duration of work	Expected results
		3. Exchanging specimens and data on equipment to improve methods of physical and mechanical properties investigations, including nondestructive methods of quality control and accelerated durability tests.			II, 1975 through II, 1976	
		4. Conducting laboratory investigation on choice of monomers and resins, conducting complex physical and mechanical investigations of specimens. Investigating, improving, and standardizing tests.			III, 1976 through II, 1978	
		5. Exchanging investigation methods for determining physical and mechanical properties of polymer-concretes, and discussions.			II, 1975 through II, 1977	
		6. Initiate research to develop new low cost systems and new uses such as desalting and geothermal applications.			II, 1975 through II, 1978	
		7. Development of recommendations for selecting monomers and synthetic resins and also catalysts and promoters of polymerization for concrete impregnation. Discussion of recommendations.			III, 1976 through IV, 1978	

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No.	Category of work	Activities in carrying out work by stages	Sponsors USSR	Sponsors USA*	Duration of work	Expected results
	b. Investigation of polymer concrete (concrete with polymer as the cementing agent).	1. Exchanging scientific technical information and documentation on application of polymer-concrete, resins for polymer-concrete, and exchange of samples of materials.	VNIIVod-polymer. Ukrainian NIIG-M.	U.S. Army Corps of Engineers	I, 1975	Recommendations on the use of polymeric compositions in repairing hydraulic structures. Recommendations on the use of resins in repair of concrete elements of hydraulic structures.
		2. Conducting laboratory and field investigations of various polymer-concretes, developed for protection of hydrostructures against wear and cavitation, and repair compositions. Investigate bond of various polymer-concretes to portland-cement concrete.			IV, 1974 through III, 1978	Recommendation on the use of polymer concretes with various resins for protections of hydrostructures against wear, cavitation, and severe environments.
		3. Preparation of a manual on selection of resins and execution of repairs with use of polymer compositions.			IV, 1975	
		4. Conducting laboratory investigations of polymer-concretes with various resins and working out designs of prefabricated polymer-concrete lining of structures and other special uses requiring strengths and durability. Investigate applications of polymer-concrete to new construction by testing various formulations for strength, creep, durability, chemical stability, erosion resistance and cavitation resistance in normal environments and environments of high temperature or high salinity.			III, 1976 through IV, 1978	

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No.	Category of work	Activities in carrying out work by stages	Sponsors USSR	Sponsors USA*	Duration of work	Expected results
		5. Develop field techniques for both monolithic and precast constructions including applications to resist abrasion and cavitation.			IV, 1978	
		6. Completing categories No. 4 (a) and (b) discuss results, prepare recommendations and report.			II, 1979	

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